



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Joanne Teh	Project Number 38499
Project Title Experimenting on the Flexural Strength of Reinforced, Renewable, and Biodegradable Casein Plastic	
Objectives/Goals The aim of this experiment was to find out if hemp fibers or wood supports would most increase the flexural strength of casein plastic. Methods/Materials To make homemade samples of casein plastic, I curdled milk using vinegar and added calcium chloride. While the plastic samples were still malleable, I added wood supports to three of the samples, hemp fibers to another three, and left the last three with no reinforcements. After the samples dried, I assessed their flexural strengths by measuring how much weight each could withstand before breaking. With the data I gathered from the test, I used the formula $R=1.05 Pl/bd^2$ to ascertain the exact flexural strength of each sample in megapascals and compare them together. Results The samples with no structural reinforcement added had an average of 7.145 megapascals of flexural strength, the samples with hemp had an average of 10.558, and the samples with wood had an average of 16.480. The experiment proved that wood supports increased the flexural strength of casein plastic more than hemp fibers. Conclusions/Discussion I had hypothesized that the hemp fibers would most increase the plastic's flexural strength, but I was proven wrong. Instead, I found out that the wood supports most increased the plastic's flexural strength. With the results of this project, it can be concluded that reinforcing beams will be of greater advantage in strengthening casein plastic. I now know that the infusion of hemp fibers into the material is an ineffective method of increasing its flexural strength, and that if I were to do another experiment on strengthening casein plastic for commercial use I should not use methods like this.	
Summary Statement My experiment found out that wood support beams within casein plastic gave it more added flexural strength compared to hemp fiber reinforcements.	
Help Received My father, Brian Teh, works as an engineer at Caltrans and was able to use his knowledge of their concrete testing techniques to guide me in creating my testing procedure and understanding the formula for flexural strength.	